

Processing, Structure and Properties of Block Copolymers

M. J. Folkes (Ed.)

Elsevier Applied Science Publishers (London and New York), £30

ISBN 0-85334-323-3

The declared aim of this book is to highlight some of the aspects of the science and technology of block copolymers that are potentially important if further advances are to be made either in material formulation or utilization. The book contains five contributed chapters by experts in a range of topics including microstructure analysis, rheology and composite mechanics. Each chapter aims to be a reasonably comprehensive review of that particular aspect of the topic.

The Introduction and Overview by S. L. Aggarwal includes an outline of the history of block copolymers, but is mainly concerned with morphology, blends based on block copolymers, rubber toughening and with block copolymers as compatibilizing agents. The chapter is well referenced and will serve as a very useful introduction to block copolymers in general.

The second chapter, The Inter-relation between Microstructure and Properties of Block Copolymers, is contributed by A. Keller and J. A. Odell. It is based virtually entirely on the pioneering work done at the University of Bristol on S-B-S block copolymers. The techniques highlighted include low-angle X-ray diffraction, electron microscopy and, birefringence and infra-red dichroism measurements. Mechanical behaviour at both low and high strains are discussed and the chapter concludes with remarks on swelling behaviour.

Melt Flow Properties of Block Copolymers by J. Lyngaae-Jorgensen is a comprehensive (109 references) review of rheology. The chapter includes a brief analysis of flow in two-phase systems. It will provide a useful introduction for anyone interested in the flow behaviour of phase-separated polymer systems.

The fourth chapter, by R. G. Arridge and M. J. Folkes, is entitled Block Copolymers and Blends as Composite Materials. It includes a brief survey of the mechanics of composites and then applies some of these theoretical ideas to the prediction of the mechanical properties of

block copolymers and to block copolymer-polystyrene blends. There is a short, but interesting, section on the development of composite microstructure during moulding.

The final chapter, Segmented Copolymers with Emphasis on Segmented Polyurethanes, is by S. Abouzajhr and G. L. Wilkes. It is basically an overview of structure-property relations of segmented polyurethanes, but also includes discussion of segmented polyether-ester copolymers and segmented polyurethane-urea materials. There is also a comparison of the behaviour of these short-block copolymers with long-block materials such as S-B-S. This is a well referenced chapter.

In conclusion, this book is clearly aimed at the specialist, but some of the chapters would be useful to students of polymer science at both the advanced graduate and the postgraduate levels. The only slight criticisms that I would have are that the index is not extensive and that the quality of the reproduction of a few of the electron micrographs leaves a little to be desired.

D. J. Hourston
(University of Lancaster)

¹³C n.m.r. Spectroscopy: A Working Manual With Exercises

E. Breitmaier and G. Bauer
(translated from the German by B. K. Cassels)

Harwood Academic Publishers (Chur, London, Paris, New York), 1984, 356 pp, US\$108; US\$44.95 each for 10 or more copies ISBN 3-7186-0022-6

This well known book was first published in 1977 and the appearance of an English translation is to be warmly welcomed. Part I contains an introduction to the principles of ¹³C n.m.r. spectroscopy (104 pages), while Part II consists of 76 exercises in the interpretation of ¹³C n.m.r. spectra and their application to structural problems in organic chemistry. The solutions are given at the end of the book, followed by a short bibliography, list of compounds and a subject index.

The exercises range from simple hydrocarbons to complex natural products and are well chosen to illustrate the wide range of methods that can be used to assist assignments and structural identification. The presentation is excellent, with each problem set out on the left-hand page and the associated spectra on the right-hand page. The time delay between publication and translation means that unfortunately there are no examples of the application of recently developed pulse sequences (COSY, NOESY etc.).

It is perhaps inevitable that a few minor infelicities have crept in as a result of translation. Thus Problem 59 refers to the spectral data depicted on the cover which, unfortunately, is no longer the same as the original. The words 'In conclusion' (pp.95,98) would have been better translated as 'As a consequence' and one could argue about the use of the word 'state' to mean structural isomers (pp.140,144). The uninitiated may find some of the Figures a little difficult to comprehend. For example, Fig. 1.2 would have been clearer had the doublets, triplets and quartets been marked, and in Figs. 3.6A and 3.7A some may be puzzled by the words 'On off', one above the other. In Fig. 3.2, A and B are reversed. In Problem 24 the starting material must surely be 4-t-butylcyclohexanone and not the hydrocarbon.

There are two Problems involving polymers. The first involves the distinction between natural rubber and gutta percha and is quite straightforward. The second concerns the distinction between atactic and isotactic polystyrene. The spectrum of the atactic polymer given in the exercise is unfortunately not sufficiently well resolved to show clearly the m, r dyads or the mmm, mmm, rmm, mrm, rrm, rrr tetrads for the main-chain CH₂ carbons and a rather loose and inaccurate explanation is given in terms of triads. It is also not correct to designate an individual unit as atactic or isotactic.

It must be emphasized, however, that these are only minor blemishes in an excellent book which will long serve the needs of those who daily grapple with the problems of organic chemistry. The price is such that a few individuals will buy the book but it can be strongly recommended for libraries and for class use at the reduced rate.

K. J. Ivin
(The Queen's University of Belfast)